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FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 81-12

32.87021 -116.43961

3430 Evaluation
August 10, 1981

RECEIVED
AUG 17 1981
TIMBER MANAGEMENT

BIOLOGICAL EVALUATION OF EQUESTRIAN CAMPGROUND SITE, LAGUNA MOUNTAIN, CLEVELAND NATIONAL FOREST

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ABSTRACT

Sites proposed for an equestrian campground and an equestrian trailhead on Laguna Mountain were examined for current and future pest problems. Fomes annosus, dwarf mistletoe of Jeffrey pine, and California flatheaded borer were found to be the major pests. Overstocked stands were noted as a predisposing condition. The forest stands, their pest problems, and suitability as long-term recreation stands are described for use in recreation facility placement. Opportunities for increasing stand health, vigor, and longevity are presented.

INTRODUCTION

Laguna Mountain Recreation Area, Descanso Ranger District, Cleveland National Forest, is a wooded plateau at 5200-6400 feet elevation east of San Diego, California. As the forested area most accessible to the inhabitants of the San Diego area, it receives up to 1.5 million visitor-days of use per year. Several campgrounds, picnic areas, summer homes, and organizational camps are located on the land administered by the Forest Service.

VEGETATION

Laguna Mountain contains about 7100 acres of timber in the yellow pine type, mostly Jeffrey pine, Coulter pine, and California black oak with a few scattered canyon live oak and incense cedar.

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INSECTS AND DISEASES

Forest pests of Laguna Mountain have received considerable attention over the years. Prior to 1975, suppression of the western pine beetle and California flatheaded borer had been practiced for fifty years. Surveys to locate western dwarf mistletoe show that this parasite is widely distributed over much of the forested area of the mountain and is extremely abundant in localized areas. Annosus root rot caused by Fomes annosus has been observed since the early* 1940's. In spite of the past beetle suppression efforts, significant tree mortality continues to occur on Laguna Mountain. Increased recreation use in some cases has led to deterioration of sensitive stands and increased levels of pest-caused tree mortality.

In 1979 the Cleveland National Forest started on a multiyear program to develop additional recreation facilities on Laguna Mountain. Because of the significance of insect and disease problems on this mountain and the need for this pest information in making decisions on location and arrangement of facilities and in managing recreation stands, a biological evaluation is being requested for each new recreation site. These biological evaluations of the equestrian campground and trailhead were conducted to determine what impact insects and diseases will have on the sites, how best to manage the vegetation in light of the current pest problems, and to prevent future losses from insects and diseases.

STAND INFORMATION

The proposed equestrian campground site is located south of Fillary Flat and south and southwest of the broom tree in Section 33, T14S, R5E. The area is a mixture of open meadow, Jeffrey pine stands, black oak stands, and mixed pine-oak stands. The stands located in the campground site are shown in Figure 1, and their stand and pest characteristics are described below.

Stand A - This is a young sawtimber-size stand of Jeffrey pine. This stand had two confirmed Fomes annosus infection centers. Some tree mortality was occurring at the margins of the F. annosus centers. Mortality from this root disease and associated insects will most likely continue as the infection spreads through the roots of the stand, and the root-disease-caused openings will continue to enlarge. Stocking density varied within this stand, with a few aggregates being overstocked. Trees within the overstocked aggregates may be expected to be attacked at any time by the California flatheaded borer and/or engraver beetles. This eventuality will increase with passage of time and, in particular, during the next drought.

Stand B - This is a small stand of old-growth Jeffrey pine, which is moderately infected by dwarf mistletoe and, as a result, some trees are in poor vigor. Tree mortality caused jointly by dwarf mistletoe and insects can be expected to occur in this stand during the next drought or before. One Fomes annosus root disease center was found on the northwest edge of this stand. Continued mortality and spread of this root disease center also can be expected.

Stand C - This is a pole-size stand of Jeffrey pine heavily infected with dwarf mistletoe. There is one confirmed F. annosus root disease center and a suspected other center. This stand is under considerable stress from the dwarf mistletoe. Much of the stand will die within the next decade or so as a result of the combined effects of dwarf mistletoe, F. annosus, bark beetles, and flatheaded borers.

Stand D - This is a stand of small sawtimber-size Jeffrey pine which is moderately infected with dwarf mistletoe. No root disease centers were found within this stand. Some future insect-caused losses of the trees more heavily infected with dwarf mistletoe and trees in overstocked aggregates can be expected to occur in this stand during the next drought period.

Stand E - This is a stand of black oak with a few scattered old-growth Jeffrey pines and an understory of scattered Jeffrey pine seedlings, saplings and poles. The oak appears to be in good health, but displays some defects, mainly limb defects, which would be hazardous to recreationists. The pine, both overstory and understory, are generally infected with dwarf mistletoe, some quite heavily.

Stand F - This sawtimber-size stand of Jeffrey pine is lightly to moderately infected with dwarf mistletoe, but otherwise appears to be in fairly good vigor.

Stand G - This stand consists of only a few scattered sawtimber-size Jeffrey pine with scattered Jeffrey pine saplings. Some larger pine have recently been cut from this area. The area is mostly grass and brush now. The few remaining overstory trees are infected with dwarf mistletoe and from here the disease is spreading down and out into the scattered pine saplings. We saw no evidence of F. annosus in this area but, with all the stumps and so few trees, some centers could easily go undetected.

Stand H - This is a sawtimber-size Jeffrey pine stand fairly well stocked. It has a Fomes annosus center on the southeastern end of the stand.

The area proposed as the site for the equestrian trailhead is located just west of the Sunrise Highway about 1 1/4 miles southeast of Fillary Flat in Section 34, T14S, R5E. The forest stand in this site is a well-stocked mixed pine-oak stand. In general the stand appears to be in fair to good vigor, although there are scattered individual trees in poor health and vigor. As with much of Laguna Mountain, the major pest problems are western dwarf mistletoe, annosus root disease, and California flatheaded borer.

Western dwarf mistletoe on Jeffrey and Coulter pines is generally distributed throughout the trailhead site as shown in Figure 2. The severity of this pest varies from spot to spot within the site from light to very heavy. Some mortality can be expected to occur in the most heavily infected pines during future dry years as the combined stresses from dwarf mistletoe and lack of moisture make them more susceptible to western pine beetles, engraver beetles, and/or California flatheaded borers.

There are 6-7 Fomes annosus root disease centers scattered throughout the trailhead site, around which current tree mortality was visible. The centers are shown in Figure 2. Most of these centers were small and contained some black oak, which are not affected by F. annosus and should remain alive and vigorous. Pines in and around these centers will continue to die, but the unaffected oaks will provide some tree cover within these centers.

Small, overstocked aggregations are scattered throughout the site. The largest of these is shown on the map of the trailhead site (Fig. 2). Because of increased competition and stress in this kind of stand, during the next dry period they will become more susceptible to attack by western pine beetles, engravers and flatheaded borers, and pine mortality can be expected to occur.

In general the oaks appeared to be in good health and had no currently important pest problems. They are in need of a hazardous-tree examination on a tree by tree basis. Dead limbs and decay were the most common defects noted.

TECHNICAL PEST INFORMATION

Information follows on the insects and diseases found on these sites: California flatheaded borer, annosus root rot and western dwarf mistletoe.

California flatheaded borer (Melanophila californica):

The hosts of the California flatheaded borer on Laguna Mountain are Jeffrey and Coulter pine. The effect of its presence is most severe in stands located on sites where environmental stress is common. Decadent or unhealthy trees are most frequently attacked, and occasionally the tops of thrifty, vigorous trees are attacked.

Larvae newly hatched from eggs laid on the outside of the tree in bark crevices penetrate directly through the bark to the phloem. Here the larvae may feed from a few months to 4 years without any apparent affect on the host tree. Should host vigor not allow them to continue developing, the larvae cut very short galleries before they die. Their galleries do not seriously injure the tree and are overgrown by the cambium. Should conditions be, or become, favorable for the larvae and unfavorable for the tree, the larvae develop rapidly and destroy the cambium. This insect can kill trees weakened by dwarf mistletoe and root disease, or render trees increasingly susceptible to bark beetles. These beetles can be suppressed indirectly by improving the health and vigor of the trees.

Annosus Root Disease (Fomes annosus):

F. annosus is a higher fungus which kills and decays the roots of many coniferous forest trees. All western conifers are susceptible to attack by this fungus.

This fungus colonizes newly cut pine stumps and their roots and from there moves via root contacts into the root systems of adjacent live trees. It moves through the roots of these live trees to the root crown, where it girdles and kills the host tree. Enlarging centers of F. annosus-killed trees are formed as this fungus travels from tree to tree through their root systems. The fungus may remain viable in the old stumps and roots of infected trees for over 50 years in east side pine, and all newly established pines whose roots contact these old stumps may be killed. Thus, these areas may be nonproductive for over 50 years. The losses associated with F. annosus include not only the original mortality but also any new coniferous vegetation growth which would have become established in the area encompassed by the center.

Western Dwarf Mistletoe (Arceuthobium campylopodum):

Western dwarf mistletoe infects Jeffrey, ponderosa and Coulter pines. Other conifers are rarely infected and hardwoods are immune. The pathogen is an obligate parasite that can exist on only a live host. It obtains all its nutrients, minerals, and water from the host tree.

This parasite is a dioecious, perennial higher plant that produces seeds which are its means of spread. In the fall of the year when the fruit falls from the stem, the seed is ejected upward and outward. The seed (covered with viscin, a sticky gelatinous substance), adheres to whatever it contacts. When the seed lands in the crown of a tree, it will adhere to the needles or limb, where it will overwinter. The following spring it will germinate and penetrate into the limb. For the next 2 to 4 years it will grow within the tree, developing a root-like endophytic system in the inner bark and outer sapwood. It will then produce aerial shoots and in another 2-4 years it will produce viable fruit.

Spread of dwarf mistletoe is limited to the distance traveled by the seed, which from overstory is usually 20-60 feet, but which may be as much as 100 feet if wind assists the seeds. A rule of thumb is that dwarf mistletoe can spread from overstory to understory a distance equal to the height of the plants in the infected trees. The actual spread rate through an even-aged stand is 1-2 feet per year.

MANAGEMENT STRATEGIES

California flatheaded borer:

California flatheaded borer is most commonly a problem where trees are under stress, unhealthy or decadent. The key to reducing the impact of this insect is to maintain a healthy vigorous stand by: 1) regulating vegetative competition through stand manipulation to achieve optimum stand density and controlling shrubs and grasses, and 2) reducing the impact of dwarf mistletoe and regenerating Fomes annosus infection centers with trees that are resistant to the disease.

In areas where there is going to be new construction, special efforts should be made to prevent damage to the selected leave trees, especially their root systems.

Annosus Root Disease:

Annosus root rot is seldom controlled in the usual sense of the word; instead, new infection centers are prevented through the use of a chemical, and stands are managed so as to minimize the effects of the fungus when present. Control practices and other measures designed to prevent hazards and reduce the impact of this disease are:

Prevention of stump infection. Granular borax, sodium tetraborate decahydrate, is registered for application to freshly cut coniferous stumps. It is effective in preventing most new infections, and its application is required on all stumps cut in or near a developed recreation site (FSM R-5 Supp. 2305.33). All of Laguna Mountain has been determined to be in or near developed recreation areas.

Early heavy thinning of young pine stands is recommended because it limits the number of successful stump infections and subsequent root disease centers. Small stumps dry out quickly and the opening of the canopy allows the sun to heat them to high temperatures lethal to the fungus.

Type conversion. Conifers planted in and around infection centers will eventually become infected and die, leaving the center unstocked. All conifers are susceptible to one degree or another, but hardwoods are rarely infected. Accordingly, hardwoods should be favored, planted, or otherwise regenerated in and around infection centers. If hardwoods are planted around infection centers, they may interrupt the continuous root contacts between conifers and slow down and stop the spread of the disease. The fungus will eventually die out in the centers so that conifers can be regenerated, but this will probably take 50 years or more.

Location of facilities. Buildings, campgrounds, picnic areas, and other facilities should not be located near infection centers. Unfortunately, most potential sites on the Mountain are located near a center. When the root disease is indicated to be near proposed developments, an on-site inspection should be made, preferably by a plant pathologist from FPM, to advise on the root disease situation at the exact alternative locations for recreation developments. It is suggested that buildings not be located near the margins of centers containing large trees which will eventually die and may fall on these structures. On the other hand, they can be located well inside centers where the danger of being hit by trees is minimal, and which will be regenerated after construction. In much the same way, roads and asphalt pads in campgrounds and parking lots can often be located in infection centers in order to take advantage of clearings which would otherwise have to be regenerated. Construction often causes additional infections due to tree scarring and root damage, and locating developments in existing centers will decrease such damage to the surrounding stand.

Removal of infected trees. Pines infected by annosus root rot usually are killed by bark beetles or borers, but sometimes an infected pine sustains extensive root decay and windthrows while still alive, causing property damage, personal injury or death. This type of tree failure occurs more

frequently in incense cedar than pine. It is recommended that a pathologist examine all centers near development before construction begins so that all trees expressing root disease symptoms or other hazards can be identified for management.

In addition, periodic inspections should be made after construction in order to identify additional hazardous trees. This inspection can be made by an FPM pathologist or by a person assigned to the Forest and trained by FPM.

Western Dwarf Mistletoe:

In developing stand management prescriptions for ponderosa, Jeffrey and Coulter pine stands infected with dwarf mistletoe, the following stand treatments or combinations of stand treatments may be used to control or lessen the impact of this pest on forest recreation stands. These suggested treatments are arranged by age classes of the recreation stands.

A. Even-aged (single-storied) stands above 6" dbh

1. Thin mistletoe-infected stands to maintain optimum growth of the residuals and reduce stress. Select against mistletoe-infected trees. Consider the removal of all trees with Hawksworth dwarf mistletoe ratings of 5 and 6. Such trees will probably die within the next 10-year period, most likely during the next drought. Treat all freshly cut stumps with borax to prevent invasion by Fomes annosus.

2. Broom prune high value dwarf-mistletoe-infected trees, if after removal of the dwarf mistletoe brooms, the trees will have a live crown ratio of 30% or more.

3. When treating stands, the creation of buffer strips should be considered at the margins of dwarf mistletoe infestations to prevent spread into or out of the treated area. These buffers should be used in the following order of priority:

a. Naturally occurring buffers (meadows, roads and changes in type).

b. Type conversion, by removal of susceptible species and regeneration with nonsuseptible species.

c. Clear cut strips.

d. Periodic (2-year) pruning of strips of lightly to moderately infected pines.

4. Pruning of all infected branches in infected trees in an attempt to eradicate this pest is generally not recommended. But in exceptional cases, where attempted on high-value trees, this treatment should be restricted to trees with a dwarf mistletoe rating of 1 or 2 which have infections restricted to the lower 1/3 of the crown. When pruning, remove all

branches in the lower 1/2 of the crown. Again, do not attempt if this will result in a tree with a live crown ratio of less than 30%, or if the tree will be exposed to continued infection from adjacent infected trees. (Schedule 6 years of resurvey/retreatment at 2-year intervals).

5. Eradication of small infestations of dwarf mistletoe patches in pole or mature timber by cutting all infected trees should be attempted only in areas of about 1 acre or less and should be inspected and retreated every 2 years for a 6-year period.

B. Even-aged stands under 6" dbh

1. Residual removal. Where infected overstory residuals threaten young developing stands, remove the infected residual trees and treat the young stands by thinning or pruning mistletoe out of infested understory stands. Plan for resurvey and retreatment of the young stand every 2 years for a 6-year period.

2. Stand destruction. Young stands (seedling-sapling) moderately to heavily infected should be destroyed along with infested overstory trees within and at margins of the treated stand. Regenerate, resurvey, and re-treat any new infections appearing along margins of treated area.

C. All-aged or multistoried stands

1. If regeneration of the stand is desired, the following steps should be taken in order:

a. Remove overstory.

b. Remove all infected trees from released understory.

c. Create a buffer strip around released stand, if needed.

d. Run post-treatment surveys every 2 years for 6 years.

2. If it is desirable to retain the overstory:

a. Remove infected understory in competition with overstory.

b. Broom prune highly valuable overstory trees.

c. In infected stands replant openings as they develop with resistant species (oaks, cedars, firs, sugar pine).

SPECIFIC MANAGEMENT OPPORTUNITIES

The pest management alternative chosen for each of the stands and aggregations depends upon the stand objectives as dictated by the placement of the campground facilities in and around the stands. But there are some limitations and opportunities that the recreation manager should be aware of in planning the placement of the recreation facilities.

EQUESTRIAN CAMPGROUND

Stand A - Trees will continue to die on the margin of the two F. annosus infection centers. These centers will continue to enlarge radially at a rate of 1 to 2 feet per year. The remaining stand is in good health, but portions of it need to be thinned to maintain good vigor and reduce future beetle-caused tree mortality. The F. annosus centers could be planted to black oak if desired. The planting of these areas prior to their use as a recreation site could give the new trees a needed head start.

Stand B - A combination of thinning to remove the heaviest dwarf-mistletoe-infected trees and broom pruning would improve tree vigor and decrease the mortality rate in the stand.

Stand C - Much of this stand is beyond help. Some thinning and pruning may save a few residual trees, but the area will lose most of its trees in the next couple of decades. Planting the F. annosus centers with black oak and interplanting the rest of the stand with a mix of black oak, incense cedar, and sugar pine would be the beginning of regenerating a new, healthier stand.

Stand E - This stand appears to be the stand which will maintain itself the longest. The good cover of healthy oaks would allow the removal of all overstory and understory dwarf-mistletoe-infected pines with a minimum loss of forest cover. Once these infected pines were removed, the area could be interplanted with any desirable mix of conifers to give the stand some vegetative diversity in the future.

Stand F - Little can be done to eliminate the dwarf mistletoe from these pines, but they are in good vigor and should respond favorably to broom pruning. This would help maintain their vigor and increase their longevity.

Stand G - This area is mostly non-stocked now. If regeneration plans are developed for this area, they should consider controlling the current dwarf mistletoe problem by removal of all dwarf-mistletoe-infected trees prior to regeneration and/or the use of non-susceptible species as planting stock. A mixed pine-oak planting may be desirable in view of the possible F. annosus problem in this area.

Stand H - This stand would benefit from a thinning and the planting of the annosus center to black oak.

EQUESTRIAN TRAILHEAD

This stand is generally in good health, and the good mix of pine and oaks should allow for a number of options in controlling the resident pest problems. Broom pruning and removal of the heavier dwarf mistletoe trees should generally improve stand vigor. In area #1 (Figure 2) most dwarf mistletoe infections of the Coulter pine are found low in the crown. It may be possible to prune these trees free from the dwarf mistletoe. Basic

to any stand treatment is to bring the stand density down to an acceptable level of stocking, or insect-caused losses will continue. The planting of incense cedar and or sugar pine would be desirable in the heavier dwarf-mistletoe-infested areas if conifers are to be retained in the future stands.

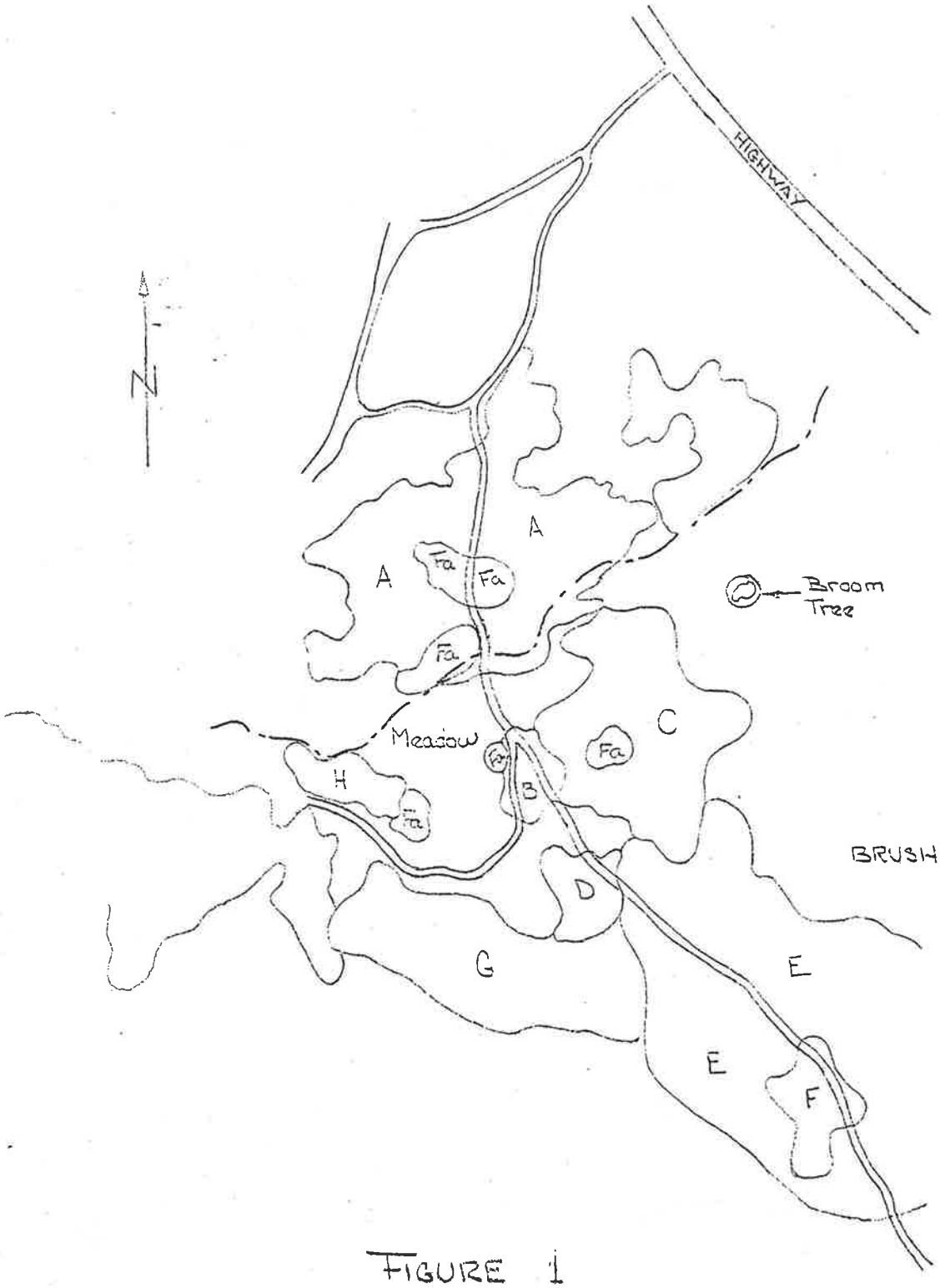

FIGURE 1

EQUESTRIAN CAMPGROUND LOCATION

FIGURE 2

EQUESTRIAN TRAILHEAD RECREATION SITE